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ABSTRACT

Producing high quality career and technical education (CTE) teachers knowledgeable about content and pedagogy is a way that states can equip students with high levels of technical and academic skills. This can help states and the nation have a higher quality workforce and become more economically competitive. CTE teacher education does not operate in a vacuum. All factors that have impacted CTE have roots in our society and economy and have affected the student, school, and community career development, higher academic achievement, assessment and accountability, diverse clientele, and technology. These four major areas affect CTE teacher education: approaches to teaching and learning; infrastructure; teacher licensure and standards; and innovative programs. Other areas of concern are accountability and assessment and teacher supply and demand. Sears and Hersh (1998) have reported a framework that suggests these components when designing effective teacher education programs: goals, curriculum, instructional strategies, contexts, learners, staff, themes, ethos, partnerships, regulations, and location. (A hypothetical university is used to present a scenario for CTE teacher education using this framework. Policy actions are identified for the federal, state, and local levels, and by business and industry, to improve

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the quality of CTE teacher education. Ninety-one references are listed.)
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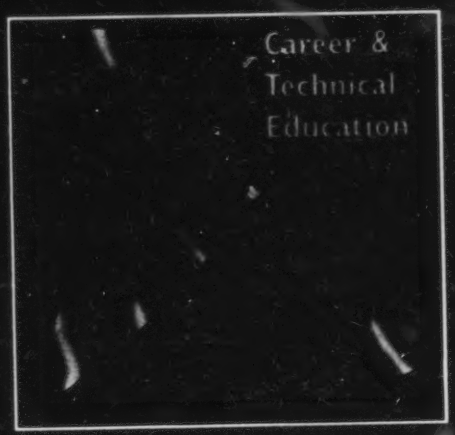

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Teacher Education in Career and Technical Education: Background and Policy Implications for the New Millennium

N. L. McCaslin
Darrell Parks

CTE CAREER & TECHNICAL EDUCATION

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TABLE OF CONTENTS

Page

Introduction 1

Individual, Society, and the Economy 5
- Career Development 5
- Higher Academic Achievement 6
- Assessment and Accountability 7
- Diverse Clientele 8
- Technology 9

Historical Overview 11
- Teacher Education 11
- Career and Technical Education 11
- Career and Technical Teacher Education 12

Trends and Issues Affecting Career and Technical Teacher Education 15
- Approaches to Teaching and Learning 15
- Infrastructure 19
- Teacher Licensure and Standards 20
- Innovative Programs 24
  - Career Clusters 24
  - Career Pathways 25
  - Career Academies 25
  - Exemplary Programs and Promising Practices 26
- Accountability and Assessment 26
- Teacher Supply and Demand 26
  - Growing Enrollments and Teacher Demand 27
  - Teacher Turnover and Compensation 27
  - A Divergent View 28

A Futuristic Scenario 31
- A Framework 31
- A Scenario 34
  - Goals 37
  - Curriculum 37
  - Instructional Strategies 38
  - Contexts 38
  - Learners 38
  - Staff 38
  - Themes 39
  - Ethos 39
  - Partnerships 39

Regulations 39
Location 39

Policy Implications 41
Federal Level 41
National Level 42
State Level 42
Local Level 45
Business and Industry 45

References 47

FIGURE

Figure 1. Conceptual framework for career and technical teacher education.....35

INTRODUCTION

Most people, when asked to identify a teacher who made a difference in their lives, have been able to remember such a person. The teachers identified often were characterized as ones who took an interest in them as students, were respectful of them as individuals, and were concerned about creating a desire to understand the subject being taught. Yet, little is known about what makes a good teacher and how that teacher contributes to academic and technical achievement (Wenglinsky, 2000a).

The attention being given to teacher quality by the media, policymakers, and researchers is high. Improving teacher quality and teacher preparation is no simple task. The debates about teacher quality and how to produce quality teachers have been intense and have created numerous policy decisions at the local, state, and national levels. In some schools, teachers receive increased salaries if their students score high on state proficiency examinations. Some states are rewarding teachers with large increases in salary if they meet the requirements of the National Board for Professional Teaching Standards. Other states, in order to meet the high demand for teachers, are changing the licensing requirements for entering teaching, and are offering alternative certification for individuals who have not taken teacher education courses. Other approaches to increasing teacher quality have been to require a master's degree or a major in the subject a teacher plans to teach.

Most of the efforts to improve teacher quality have been designed to manipulate teacher inputs, with the hope that the input will lead to improved student academic performance (Wenglinsky, 2000b). Wenglinsky indicated that there was little empirical evidence of a link between improved teacher inputs and improved student achievement.

Wenglinsky (2000a) studied the link between student achievement and three aspects of teacher quality in the teaching of eighth-grade mathematics and science: (a) what teachers do in the classroom, (b) professional development in support of these activities, and (c) non-classroom aspects such as teacher education levels. He found that students whose teachers emphasized higher-order thinking skills, small-group instruction, and hands-on learning activities outperformed their peers. Wenglinsky also found "...that teachers who receive rich and sustained professional development generally, and professional development geared toward higher-order thinking skills and concrete activities such as laboratories particularly, are more likely to engage in effective classroom practices" (p. 32).

Wilson, Floden, and Ferrini-Mundy (2001) examined more than 300 published research reports about teacher preparation and found 57 that met their criteria for inclusion in their report. Wilson, Floden, and Ferrini-Munday's criteria for inclusion included: (a) required a direct relationship to one of the following five questions—(1) What kind of subject matter preparation, and how much of it, do prospective teachers need? Are there differences by grade level? Are there differences by subject area? (2) What kinds of pedagogical preparation, and how much of it, do prospective teachers need? Are there differences by grade level? Are there differences by subject area? (3) What kinds, timing, and amount of clinical training ("student teaching") best equip prospective teachers for classroom practice? (4) What policies and strategies have been used successfully by states, universities, school districts, and other organizations to improve and sustain the quality of pre-service teacher education? (5) What are the components and

characteristics of high-quality alternative certification programs? Wilson, Floden, and Ferrini-Mundy reported a positive connection between teachers' preparation in their subject matter and their performance and impact in the classroom. However, little definitive research has been conducted on the kinds or amount of subject-matter preparation. In regard to pedagogical preparation, studies reinforced the view that pedagogical aspects of teacher preparation are critical, both for their effects on teaching practice and their ultimate impact on student achievement. Wilson, Floden, and Ferrini-Mundy also reported that field experiences too often are disconnected from, or not well-coordinated with the university-based components of teacher education. Prospective teachers' conceptions of the teaching and learning of subject matter can be transformed through their observations and analysis of what goes on in real classrooms. In the area of policy and strategies used to improve and sustain the quality of pre-service teacher education, too few studies have been conducted to make confident statements. Wilson, Floden, and Ferrini-Mundy found that alternative-route programs have been successful in recruiting a diverse pool of teachers; however, they have a mixed record in attracting the "best and brightest," and background in subject matter alone is not enough to prepare new teachers.

The effectiveness of teacher education programs in institutions of higher education has been discussed extensively, and opinions vary widely. Groups such as the Thomas B. Fordham Foundation (1999) indicate that teacher education institutions (TEIs) are largely ineffective. The National Commission on Teaching & America's Future (1996), on the other hand, are complimentary of TEIs. Undoubtedly, TEIs are neither all effective nor ineffective—but some are more effective than others.

Wenglinsky (2000a) examined the relationship of TEIs and schools, colleges, and departments of education housed in higher education institutions to students' Praxis II scores, primarily from the Southeastern United States. He concluded that "...institutions of higher education are appropriate as sites for teacher preparation" (p. 32). He also concluded that teacher education institutions should "...place greater emphasis on content areas and less on preparation in professional knowledge" (p. 32). Wenglinsky also stated that "...until all TEIs operate at a high level, policymakers need to facilitate access to high-quality TEIs for students from less advantaged backgrounds" (p. 33). Lastly, Wenglinsky recommended that future reform efforts in teacher education "...need to be based on research that links teacher preparation practices to teacher effectiveness and other desired outcomes" (p. 33). Drew Gitomer, Vice President of the Research Division of Educational Testing Service, stated in the preface that, "Wenglinsky's results make clear once again that teaching requires a mastery of both content and pedagogy, and that one at the exclusion of the other is insufficient" (p. 3).

A similar case could be made for career and technical teacher education. First, little is known about what makes a good career and technical education teacher and how that teacher contributes to academic and technical achievement. Second, an inadequate knowledge base is available regarding what the career and technical education teacher does in the classroom. Finally, there is little in the literature regarding what constitutes an effective career and technical teacher education program.

This paper will provide a context for education, an historical overview, a description of the magnitude of career and technical education, and trends and issues impacting career and technical teacher education. Additionally, it will recognize new approaches to career and technical teacher education, and identify components of a career and technical teacher education program. Finally, it will identify policy implications at the local, state, and national levels.

INDIVIDUAL, SOCIETY, AND THE ECONOMY

The overall purpose of education is to prepare people to perpetuate and improve the society in which they live. An educational program in any nation must be related to its political, social, and economic way of life. That is particularly true in the case of career and technical education. The National Association of State Directors of Career Technical Education Consortium (undated) indicated that Career Technical Education

> is provided in a variety of settings and levels including middle school career exploration, secondary programs, postsecondary certificates and degrees, and customized training for employees in the workplace. Career Technical Education also provides students and adults (1) the technical skills and knowledge necessary to succeed in occupations and careers, (2) the cross-functional or workplace basics necessary for success in any occupation or career (such as problem solving, teamwork, and the ability to find and use information) as well as skills for balancing family and work responsibilities, and (3) the context in which traditional academic skills and a variety of more general educational goals can be enhanced (p. 1).

Historically, career and technical education (CTE) teachers have been responsible for preparing individuals to enter into and succeed in the labor market. This relatively straightforward charge entailed equipping students with the essential knowledge and work-related skills to meet the demands of the contemporary workplace.

By contrast, career and technical teachers today are faced with a plethora of additional expectations and demands that tend to make the CTE teacher of the 20th century obsolete. First, they were expected to assist in accommodating the growing career development needs of students to be more aware, informed, and technologically prepared for the myriad employment opportunities awaiting them at some point in their futures. Second, CTE teachers were charged with preparing students who were more competent in academic achievement in mathematics, science, and communications, and who demonstrated higher order skills in reasoning, problem-solving, and collaborative work. Additionally, CTE teachers were held to ever-increasing demands for greater accountability. At the same time, teachers were expected to serve a more diverse student clientele who were educationally and socially challenged. Finally, CTE teachers were in the midst of a technological revolution that required ongoing curriculum revision. The expectations for CTE teachers in the late twentieth century were quite different from those in the past, and they will need to be prepared to meet the challenges that confront them in the 21st century. All of the forces that have impacted career and technical education had roots in our society and/or economy, and have significantly impacted the student, the school and the community. Each of these factors will be discussed further.

Career Development

Schools have had a long history of providing career development activities such as career days, career counseling, career and technical student organizations, and supervised work experience programs. Career and technical student organizations and some type of supervised work experience program have had a long history in career and technical education. However, in the early '70s, interest grew toward a more comprehensive approach to career development that included all public school students.

Dykeman, Herr, Ingram, Wood, Charles, and Pehrsson (2001) identified 44 types of career development interventions. Each intervention was rated on five variables: time (short/long term), mode (active/passive), control (adult/youth), place (school/community), and size (individual/group). Based on these variables, four categories of career development activities were identified: (a) introductory career interventions, (b) advising interventions, (c) curriculum-based career interventions, and (d) work-based career interventions.

Congruent with the work of Dykeman et al. (2001), one state (Ohio) created a K–12 career education model that included:

(1) *Career motivation*, a K–6 curriculum infusion model for all students aimed at developing a positive attitude toward the world of work and creating a desire to be a part of the work world. Activities included field trips, career fairs, personal/social development, and career counseling.

(2) *Career orientation* for seventh- and eighth-grade students that provided students the opportunity to gain awareness of the many occupations awaiting those who were prepared. The career orientation program included such activities as career-focused parent/student conferences, career maps, career maturity and interest assessments, and career/library resource centers access.

(3) *Career exploration* focused on grades 9 and 10 (14- and 15-year-old students), and provided an opportunity for youth to examine and gain firsthand experiences in several career opportunities that were congruent with their respective interests and abilities. Career clusters/pathways/majors were introduced along with computer-assisted career guidance and career passports.

(4) *Career preparation* for students ages 16 and older that included:

i. comprehensive career and technical education aimed at preparing youth with job skills and technical knowledge, work habits and attitudes for employment, and

ii. pre-professional education programs aimed at providing the academic preparation and cluster skills to pursue a professional pathway after high school.

Included in the career preparation phase were work-based interventions, such as cooperative education, internships, job shadowing, job coaching, work study, and youth apprenticeship. Dykeman et al. (2001) found that career development activities were largely adult-controlled, school-based, and individually delivered.

Higher Academic Achievement

Changes in the workplace have impacted high school reform in terms of higher standards and expectations for academic achievement, as well as enhanced technical competence and the ability to make applications in the context of the world of work. One of the goals of the American Association for the Advancement of Science (1990) was to increase student economic productivity through the use of the knowledge, understandings, and skills of science. The impact of the changing workplace made it clear that scientific literacy was vital for many different jobs

in today's workplace. Similar cases have been made for the disciplines of mathematics and language arts.

Expectations for higher academic achievement gave rise to the integration of academic and career/technical education movement, starting with the Carl D. Perkins Vocational and Applied Technology Education Act of 1990. Secondary educational institutions were encouraged to link academic and CTE curricula, and emphasize their interrelatedness in real-world contexts. The intent was to connect the curricula of various subjects so that students would be able to address in a holistic manner the problems, concerns, and issues of the environments in which they lived.

Urquiola, Stern, Horn, Dornsife, Chi, Williams, Merritt, Hughes and Bailey (1997) noted that curricular integration is "...a natural means of...simultaneously prepar(ing) students for skilled jobs and, with the incorporation of reformed pedagogy, develop(ing) critical thinking and collaboration skills" (p. 72). According to Beane (1998), the concept of curriculum integration illustrated the potential for academic and vocational education to connect students to all aspects of the workplace. Beane further noted:

> ... integration as a curriculum design has several features: problems and issues of personal and social significance guide curriculum; learning experiences are designed to integrate knowledge in context of its use; knowledge is developed and used to address relevant issues, not in preparation for future tests; and learning activities involve the application of knowledge in real-life settings where students can experience problem solving and the intricacies of social interaction. (p. 5)

Assessment and Accountability

Accountability has been an area of concern for career and technical education for many years. Early efforts toward greater accountability included follow-up studies to determine the degree to which CTE graduates found placement in jobs related to their training. The Vocational Education Act (1963) was the first piece of legislation that mandated the need for states to conduct evaluations of their CTE programs. Since that time legislation has continued to stress the importance of accountability (i.e., the Vocational Education Amendments (1968), the Education Amendments of 1976, the Carl D. Perkins Vocational Education Act (1984), the Carl D. Perkins Vocational and Applied Technology Education Act (1990), and the Carl D. Perkins Vocational and Applied Technology Education Amendments, (1998). Plank (2001) studied the outcomes of alternative curricular pathways through high school, and found that the academic performance in core subjects was similar between academic concentrators and those with both academic and career and technical concentrations (dual concentrators). Students who were career and technical education concentrators trailed both the academic and dual concentrators by a significant amount in their performance in core subjects. However, career and technical education had a positive effect in reducing the likelihood of dropping out of high school. Thus, combining career and technical education with academic coursework may have increased student attachment to school and increased the probability of completing high school. Such an observation carried significant social-demographic and economic implications.

Another facet of accountability and assessment was the role of technology in assessment. As Austin and Mahlman (2000) noted, educational technology has ranged from blackboards to audiovisual media, but computers, networks, and hypermedia comprise a new frontier.

Bennett (1999) identified four generations of technology assessment: computerized testing (CT), computer adaptive testing (CAT), continuous measurement (CM), and intelligent measurement (IM). Advantages of computerized assessment included:

- rapidity of feedback,
- monetary savings over time,
- enhanced security,
- more instructional time due to less time spent on assessment, and
- capability to track process-oriented variables.

However, there were also some potential disadvantages to technology assessment:

- cost of equipment and professional development,
- marginalization of groups based on demographics and socioeconomic status, and
- missed opportunities to effectively utilize authentic assessments.

While technology assessment had broad and deep implications for career and technical education, it is still in its infancy in terms of potential and application.

Diverse Clientele

According to Wentling and Palma-Rivas (2000), the changing work force has been one of the most extraordinary and significant challenges facing the U.S. today. The work force has become increasingly diverse, and these population changes will continue for many years. Demographic changes have been away from the European-American male and toward an increasingly diverse and segmented population, including men and women of all races, ethnic backgrounds, ages, and lifestyles. This change in the work force included more people of diverse sexual/affectional orientations and religious beliefs, and different physical abilities who needed to work together effectively.

Currently, racial and ethnic minorities make up 28% of the U.S. work force (U.S. Census Bureau, 1998). By 2010, it is projected that Hispanics will supplant African Americans as the nation's largest minority group, and that Hispanics, African Americans, and Asians will outnumber non-Hispanic Whites in the 21st century. These dramatic changes in societal and workforce demographics present major challenges in language differences, cultural beliefs, and work attitudes that will have a direct bearing on how career and technical education is designed and delivered in the public schools.

Furthermore, women have made a dramatic impact of the work scene in America. In 1997, approximately 60% of American women were in the labor force, up from 33% in 1950. As noted by the U.S. Bureau of Labor Statistics (1998), in 1980, women made up 43% of the total work force. By 2010, they will represent more than 48% of the work force and, along with immigrants, White women will account for 85% of the net growth in the nation's labor force.

Demographic and diversity issues have been and will continue to exert significant influences on career and technical education. Regardless of whether these issues are looked upon as societal, workplace, or educational issues, they cannot be ignored.

Technology

The impact of technology on career and technical education has not been limited to assessment. Technology has found its way into the instructional process as a teaching tool—both from the standpoint of a teaching tool and a learning process that facilitates self-paced learning and tutorial assistance.

One dimension of technology on CTE has been in the area of professional development. Brown (1998) noted that linkages with other teachers were an important professional development strategy for sharing practice and knowledge, and technology facilitated those linkages. Grubb and Hines (1999) also noted the importance of training faculty as distance learners. Schrum (2000) listed the following direct advantages of an online professional development model:

- instantaneous and delayed communications options,
- access to and from isolated communities,
- multiple and collaborative participation among widely dispersed individuals,
- ultimate convenience, when and where one chooses to be involved,
- interaction and collaboration among individuals from diverse cultures and academic backgrounds, and
- ability to focus on ideas without knowledge of race, gender, age, or other prejudicial factors.

Electronic forms of professional development can save teachers and administrators time and money in terms of travel costs. But, just as important, CTE distance learners enhance their own technology skills that are transferable to the classroom, either as an instructional tool or an assessment strategy.

Some states have developed online learning and distance delivery methods for career and technical teacher education. For example, Virginia Polytechnic Institute and State University (2001) has offered both a teacher licensure and master of science degree via distance learning. The teacher licensure program is a six-course program designed for provisionally licensed career and technical education teachers. The master of science degree program is designed to develop

instructional leaders in the field of career and technical education. Another example, Indiana University of Pennsylvania (2001) has developed an "online" university to provide access to credit-bearing certification courses, resources for professional development, and occupational training, teacher networking, and expertise from private business and industry. Wright State University (2001) has developed a graduate-level 43-quarter-hour teacher licensure program. This program can be completed over a two-year period, and is part of a 55 quarter hour M.Ed. program.

HISTORICAL OVERVIEW

Public education began to take root in this country after the Revolutionary War era when government, church, and civic leaders realized that for a fledgling democracy to flourish, an educated populace was imperative. Until that time, education was in the form of apprenticeship training or schooling provided in the home or through private institutions. In the early 1800s, public schools began to spring up, particularly in the New England area, and a growing need for competent and qualified teachers became increasingly apparent.

Teacher Education

In 1839, in response to the growing need for teachers, Horace Mann, the Secretary of Education in Massachusetts, organized and operated the first normal school in the Town Hall of Lexington, MA, designed to prepare teachers. The normal school concept flourished and soon became very popular, even though it operated on the basis of a very narrow curriculum and under minimum standards relative to the selection and preparation of teachers. However, normal school institutions did tend to provide a better teacher than had been previously realized, giving rise to the evolution of teacher education and colleges of education as a means of meeting the growing teacher needs in this country.

However, the evolution of professional teacher education was not without controversy. Teacher education, in general, was suffering from anti-intellectualism. Brubacher (1966) noted that such sentiment stemmed from two major points: (1) students were woefully deficient in their knowledge of the liberal arts, and (2) the professional study of education had proliferated so many courses, they were thin and overlapping.

Assertions were made that education was not a discipline in the first place. According to some critics, the real facts regarding the necessity for an advanced general (liberal arts) education for teachers were not based on an analysis of the value of such an education to teachers, but rather on the general theory that any teacher must be an "educated person."

In more recent times, other forces have come into play on teacher education. National certification standards have arrived on the scene and have made their impact felt on the preparation of teachers. And reports from the Holmes Group, Inc. (1986), have also impacted teacher education, and have added tension about the role and design of teacher education throughout the nation.

Career and Technical Education

The roots of vocational education (career and technical education) go back to the beginning of mankind. Fathers and mothers have always transmitted the knowledge and skills of their culture to their children in order to teach them to survive, and each new generation added something to the total of the knowledge and skills base. Work to sustain existence and the care of children and abode were basic to sustaining life.

From this basic form of existence, a transition occurred toward family-owned entrepreneurial enterprises that provided essential services and products to the needs of society. Many such enterprises centered on craft- and trade-oriented businesses, or an agrarian way of life in the form

of family farms. But as this young nation's economy started to grow, there was a gradual shift from an entrepreneurial/agrarian way of life to an era of industrialization. Factories sprung up and fathers abandoned the family businesses to work in the industrial workplace. No longer were they available to pass their trades or crafts and know-how on to their sons, as the concept of mass production increased the demand for more and more skilled workers. It became apparent that this country needed a more structured approach to preparing those skilled workers.

Career and technical education had its origins in the colonists' apprenticeship programs. The apprenticeship programs included full-time work, on-the-job training, and additional instruction in the theory of the craft. However, the master craftsmen, who served as apprenticeship instructors, were required to teach more than their respective trades. They were also required to provide instruction in civic and moral responsibility. But many masters were unable to provide adequate non-vocational instruction, and during the 18th century they began to send their apprentices to evening schools for the three Rs (reading, writing, and arithmetic). This was the first example of the separation of vocational and academic instruction.

In 1862, vocational education took on new significance. Passage of the Morrill Act established this nation's land grant college system and provided educational pathways for the preparation of individuals schooled in the fields of agriculture and the mechanical trades. At the same time, the movement for the education of young girls and women was gaining ground and was attached to the land grant concept. Concurrently, states were concerned about how to meet their rapidly growing skilled worker needs, and various organizations began to spring up that had, as their main focus, the preparation of a skilled workforce. Examples of such organizations included National Association for the Promotion of Industrial Education based in New York and the Vocational Education Association of the Middle West (which ultimately became a part of the American Vocational Association).

In 1914, a Congressional Commission on National Aid to Vocational Education was established to study the needs and report its findings to Congress. The findings of this commission resulted in the passage of the Smith-Hughes Act (1917)—the first federally enacted legislation to promote vocational education in public high schools in America. This act provided federal funds for vocational education at the secondary level in the areas of agriculture, trades and industry, and home economics.

Career and Technical Teacher Education

The Smith-Hughes Act was also the first federal legislation to make funds available to train teachers. Sections 2, 3, and 4 in the Act authorized the use of funds to be paid to states for the purpose of paying the salaries of teachers, supervisors, and directors and in the *preparation* of teachers, supervisors, and directors. The George-Deen Act (1936) extended the coverage of vocational education to include distributive education. The George-Barden Act Amendments (1956) extended coverage to include practical nursing and the fishery trades. The Vocational Education Act (1963) included business and office education.

Throughout the history of career and technical education, extensive discussion has taken place about distinguishing between education for the mind (head) or for work (hand). Early in the history of career and technical education, the Federal Board for Vocational Education was

designated by Congress to administer the Smith-Hughes Act. The Federal Board for Vocational Education and Charles Prosser, the Board's first administrator, emphasized the importance of developing the skills necessary in a craft or trade. Similarly, the Federal Board indicated that teachers should be knowledgeable of the skills needed by crafts or trades if they were to be successful as teachers, and that college and university courses contributed little or nothing to the training of secondary vocational education teachers. Teachers of trade and industry and health occupations have often been prepared in line with Prosser's concept.

Others, such as Dewey (1933), advocated that education should prepare students for a lifetime of learning using social activities as its center. Thus, teachers must be prepared in general education and in professional education courses dealing with the context and understandings related to students' activities. Teachers of agriculture, business, family and consumer sciences, and marketing have been prepared congruent with Dewey's concepts.

There has been a great deal of separatism in the way vocational education teachers and general education teachers have been prepared. For years, vocational education teacher requirements have mandated a number of years of experience in their craft or trade outside the classroom prior to their employment as a teacher. Lynch (1996) indicated that in the areas of trade and industrial education and health occupations, alternative state certification schemes would allow those with a high school diploma, or its equivalent, and extensive occupational experience (ranging from two to nine years, with an average of four years) to teach. Bruening, Scanlon, Hodes, Dhital, Shao, and Liu (2001) found that occupational experience or occupational competency was used in combination with coursework and testing to certify teachers. Bruening et al. also reported that a minimum cumulative GPA of 2.5 was required for teacher certification program entry into more than 59% of the programs. This represents a substantial change over the 9% having a minimum GPA requirement of 2.2 that was earlier reported by Lynch (1991).

Bruening et al. (2001) also found that the educational reform movement has had an important impact on preservice career and technical teacher education programs. Areas of educational reform impacting preservice teacher education programs included integrating academic and vocational instruction, designing meaningful instructional tasks based on real world problems, advancing student learning, using technology, teaching teamwork and collaboration skills, constantly monitoring change, and developing leadership skills.

The career and technical education teacher for the 21st century must be prepared to relate to an increasingly diverse student clientele. Additionally, this diverse student clientele must perform at higher levels of academic and technical proficiency. Furthermore, the students will need to be able to reason analytically, solve complex problems, and gather and process information and data.

The National Commission on Teaching and America's Future (1996) reported that in recent years, more than 50,000 people have entered teaching annually on emergency or substandard licenses. Of the newly hired teachers, 12.5% had no license and 14.9% were on temporary, provisional, or emergency license. Additionally, 25% of all secondary teachers do not have a college major or minor in their main teaching field.

Darling-Hammond (1992) summarized over 100 research studies on teaching and knowledge, and concluded that fully prepared teachers were more effective in the classroom, and their students demonstrated larger achievement gains than students whose teachers were not fully prepared. Wenglinsky (2000b) found that teachers' classroom practices greatly influenced student achievement. Student achievement also increased when students had training in developing higher order thinking skills, who were skilled at implementing hands-on experience in the classroom, and who were trained to work with special populations.

TRENDS AND ISSUES AFFECTING CAREER AND TECHNICAL TEACHER EDUCATION

Career and technical teacher education does not operate as an island unto itself. Four major areas that impact upon career and technical teacher education include: approaches to teaching and learning, infrastructure, teacher licensure and standards, and innovative programs. Each of these topics will be discussed in this section.

Approaches to Teaching and Learning

The psychological approaches in education have changed significantly in the last 50 years. From about 1920 to 1970, much of what happened in the classroom was influenced by the behaviorist approach to psychology. Behaviorists such as Skinner (1938, 1953) theorized that human behavior was highly shaped by its consequences. Skinner also felt that psychology was primarily about behavior, and that behavior was largely determined by its outcomes. Other psychologists and educators thought that the behaviorist approach to psychology failed to take into consideration how students learn to develop strategies for learning. Today, cognitive psychologists portray learners as being active processors of information and assign priority to the knowledge and perspective students bring to their learning.

The University of Helsinki (2001) indicated that cognitive psychology "...studies human cognitive processes such as perception, learning, memory, skill acquisition etc., which are properties of human *mind*, not of his/her brain" (www.helsinki.fi/hum/kognitiotiede/cogsci.html). The Academic Press Dictionary of Science and Technology (Harcourt, Inc., 2001) defined cognitive psychology as "...the branch of psychology that attempts to explore and explain processes of sense, perception, memory, and thought, as contrasted with other approaches that focus on observable behavior or on the unconscious." Encyclopedia.com (2001) included cognitive processes such as problem solving and memory in its definition of cognitive psychology.

Sternberg and Williams (2002) identified three main approaches to cognitive development:

1. Piaget's stage theory of cognitive development,
2. Vygotsky's sociocultural theory of cognitive development, and
3. information processing theories.

Piaget's theory proposes four stages of cognitive development: sensorimotor (occurring between birth and age 2), preoperational (generally occurring between 2 and 7 years of age), concrete (occurring from the ages of 6 or 7 to 12 years), formal (beginning at about 11 or 12, and extending through adulthood). Piaget's theory specifies quantitative changes in cognitive development with each succeeding stage. Piaget stated that children, regardless of their age, actively seek to explore the world and to come to terms with it—largely from the inside, outward. Piaget's theory was prominent in the 1960s and 1970s.

Vygotsky's sociocultural theory of cognitive development takes a different view from that of Piaget. Vygotsky theorized that cognitive development occurs largely from the outside, inward. Cognitive development occurs due to children's interactions with the people with whom they come in contact. Vygotsky recognized that cognitive development depends as much on social and other environments as it does on maturation, and that it occurs continuously, rather than in stages. Vygotsky's theory was most prominent in the 1980s and 1990s.

Information-processing theories—the third approach to cognitive development—seek to explain cognitive development in terms of how individuals of various ages process information and represent it in their minds (Klahr & MacWhinney, 1998). These theories tend to see cognitive development occurring continuously, without stages, as a result of the child's learning and level of maturity. Information-processing theories of cognitive development have been in the literature from the mid-1980s forward.

Cognitive theorists stress the role of thinking in the learning process—the importance of knowing why—and believe that the teacher is to provide learners with opportunities and incentives to learn. Feden (1994) stated that cognitive theorists believe, among other things, that:

- all learning, except for simple rote memorization, requires the learner to actively construct meaning;
- students' prior understandings and thoughts about a topic or concept before instruction exert a tremendous influence on what they learn during instruction;
- the teacher's primary goal is to generate a change in the learner's cognitive structure, or way of viewing and organizing the world;
- learning in cooperation with others is an important source of motivation, support, modeling, and coaching (p. 19).

Ormrod (2000) identified several basic assumptions underlying cognitive psychology. These assumptions included:

- Cognitive processes influence the nature of what is learned.
- People are selective about what they process and learn.
- Meaning is constructed by the learner, rather than being derived directly from the environment.
- Prior knowledge and beliefs play a major role in the meanings that people construct.
- People are actively involved in their own learning (pp. 225-226).

Thomas (1992) identified several reasons for supporting the relevance of cognitive theory to vocational education at all levels. Reasons for these arguments included:

- a changing environment in which cognitive capacities are critical to survival and flourishing of both people and organizations,
- an obligation to understand and serve the needs all students have for learning,
- the importance to the individual and collective quality of life in a democracy of cognitive capacities well distributed across the citizenry,
- the potential of cognitive theory to guide educational practice toward meeting these challenges (p. 6).

Cognitive development theorists have more recently taken a constructivist view of learning. Constructivism emphasizes "the learner's contribution to meaning and learning through both individual and social activity" (Bruning, Schraw & Ronning, 1999, p. 215). Constructivism contends that people construct meaning through their interactions with and experiences in their social environments. It presumes that prior knowledge and experiences play a significant role in learning and form the basis for subsequent actions. It focuses the learner's attention on the "why" of learning and opens the door to critical thinking and intellectual development (Manus, 1996). Constructivism builds on the research of cognitive psychologists such as Piaget, Vygotsky, Bartlett, Bruner, and Dewey. Although there is no one constructivist theory, most constructivist approaches recommend: (a) compelling, challenging learning environments and authentic tasks; (b) social negotiation and shared responsibility as a part of learning; (c) multiple representations of content; (d) understanding that knowledge is constructed; and (e) student-centered instruction (Driscoll, 1994; Marshall, 1992). Student-centered instruction is sometimes referred to as constructivism "...because it sees students as constructing their own understanding" (Sternberg and Williams, 2002, p. 444).

Brown (1998) indicated there are a number of ways constructivism can be articulated. "Some of these include the development of learning environments that incorporate *learner-centered teaching practices, problem-based learning, contextual teaching and learning experiences, integrated academic and vocational curriculum,* and *authentic assessments"* (p. 27). All of these learning environments have been used in career and technical education since it first began—shortly after the beginning of the 20th century. Some would argue that integrated academic and vocational curriculum was not a part of early vocational education. However, fields such as construction, agriculture, family and consumer sciences (among the first vocational areas authorized by the Smith-Hughes Act in 1917) had to use mathematics and science in solving problems at that time. Dewey (1933), one of the major philosophers studied by career and technical education students, suggested the importance of thinking as a method of education.

Cooperative learning refers to an instructional approach in which students work with three to five members of their class to achieve agreed-upon goals and help one another learn. In most instances, instructors are encouraged to assemble mixed-ability groups, and students are rewarded on the basis of the success of the group. It is important to note that just because students work in small groups, there is no assurance they are involved in cooperative learning.

Stahl (1994) indicated that the following elements or requirements for cooperative learning must be met:

- a clear set of specific student learning outcome objectives,
- all students in the group "buy into" the targeted outcome,
- clear and complete set of task-completion directions or instructions,
- heterogeneous groups,
- equal opportunity for success,
- positive interdependence,
- face-to-face interaction,
- positive social interaction behaviors and attitudes,
- access to must-learn information,
- opportunities to complete required information-processing tasks,
- sufficient time spent in learning,
- individual accountability,
- public recognition and rewards for group academic success, and
- post-group reflection (or debriefing on within-group behaviors).

Qin, Johnson and Johnson (1995) conducted a meta-analysis of 46 studies published between 1929 and 1993, and concluded that members of cooperative teams outperformed individuals competing with each other on four types of problems—linguistic, nonlinguistic, well-defined, and ill-defined. Slavin (1995a, 1995b), a leading proponent of cooperative learning, found that cooperative learning increased students' tolerance for others from differing backgrounds and gender. He also found that student achievement increased across content areas on both standardized tests and custom-designed assessments. Other outcomes of cooperative learning included increased interpersonal skills and increased interaction among students.

Contextual teaching and learning represents another approach to teaching and learning. Howey (1998) defined contextual teaching and learning as "...teaching that enables learning in which students employ their academic understandings and abilities in a variety of in- and out-of-school contexts to solve simulated or real-world problems both alone and with others. Activities in which teachers use contextual teaching strategies help students make connections with their roles and responsibilities as family members, citizens, students and workers" (pp. 20-21). Contextual teaching and learning uses problem-based learning, cooperative learning, project-based learning, service learning, and work-based learning (Berns & Erickson, 2001).

The Office of Vocational and Adult Education, U.S. Department of Education, funded a project in 1997 at The Ohio State University, in partnership with Bowling Green State University, designed to help prepare teachers to use contextual teaching and learning strategies to enhance student success in and beyond school (Berns and Erickson, 2001). From that work, seven additional projects were funded. An interactive, Web-based model of excellence for the in-service professional development of P–12 teachers in the effective use of contextual teaching and learning was also funded at Bowling Green State University. Johns Hopkins University was funded to develop, demonstrate, and evaluate an in-service professional development approach and materials for high schools supporting contextual teaching and learning within a Career Academy structure. A TeachNet model was funded at the University of Wisconsin at Madison to enhance in-service professional development programs by providing teachers with opportunities to participate in workplace/community learning experiences, and assisting them in applying what they learned to instructional processes. A project designed to complete a cross-program analysis of the profiles of five university pre-service teacher preparation programs that exhibit characteristics of career and technical education was funded at The Ohio State University. The University of Georgia was funded to develop and implement a pre-service teacher education model that was based in a theoretical framework of contextual teaching and learning. The Washington State Contextual Education Consortium was funded to engage professors of education and arts and sciences with K–12 teachers in demonstrating innovative contextual teaching and learning classroom strategies. A project to promote a highly qualified and diverse teacher work force for the nation's urban schools by expanding on the successful school-to-career approach of teacher academies was funded at the Urban Teacher Academy Project.

Infrastructure

Infrastructure has been defined as "the resources (as personnel, buildings, or equipment) required for an activity" (Merriam-Webster's Collegiate Dictionary, 2001). High quality career and technical teacher education programs require personnel (e.g., faculty, staff, and students), productivity tools (e.g., curriculum, technology, professional development opportunities, supplies, and telecommunication technology), and physical facilities (e.g., buildings, libraries, classrooms, and laboratories). Unfortunately, higher education—for the most part—has failed to invest in career and technical education personnel, productivity tools, and physical facilities to support quality teacher education programs. In regard to funding infrastructure, the National School Boards Association (2001) stated, "Beyond the special needs of students, our schools need greater federal funding in many other areas. These include teacher hiring, training, and professional development. Many schools also need modern computers and other technology to improve learning and ensure that children are technologically proficient and prepared to succeed in the electronic information climate. Finally, many schools need additional money for construction and renovation" (National School Boards Association, 2001, Policy Research Brief, Federal funding for education).

Lynch (1991) reported 428 colleges or universities that offered one or more preservice vocational teacher education programs. However, Lynch found these numbers questionable, since at least 10% had closed their vocational teacher education programs or had not graduated any vocational teacher education students in years. Bruening, Scanlon, Hodes, Dhital, Shao, and Liu (2001) updated the Lynch (1991) study to determine if the number of programs and administrative characteristics had changed over the past 10 years. Bruening et al. identified a total

of 385 institutions (a decrease of approximately 10% from the 1991 Lynch study) that prepared career and technical teachers for certification.

The public supports the need for highly qualified teachers (Rose & Gallup, 2001). Rose and Gallup asked respondents to The 33rd Annual Phi Delta Kappa/Gallup Poll of the Public's Attitudes Toward the Public Schools to rate six strategies for addressing the teacher shortages expected due to retirement and increased student enrollment. The strategy with the highest support (89%) was to make it easier for teachers to transfer pension benefits and to receive salary credit when changing jobs between school districts and states. The second-highest supported strategy (88%) was to raise teacher salaries; the third-highest supported strategy (73%) was to have the federal government provide loans that would be forgiven if the prospective teacher entered the field of teaching; and the fourth-highest supported strategy (61%) was to recruit qualified teachers from other countries. The two strategies with the highest level of opposition included lowering state requirements for the training to become a licensed teacher (82%) and permitting persons with bachelor's degrees to become teachers without requiring preparation in the field of education (67%).

The National Alliance of Business (2001) reported that "...we must have superbly prepared teachers....We will not get there unless we expect much of teachers and ensure that they have the knowledge and tools to do their jobs effectively. We will not get there without fundamental changes in the way we prepare, support, and compensate teachers" (p. 6). The report went on to say, "Teacher preparation programs must ready teachers to teach in a standards-based system by aligning courses within arts and sciences and schools of education and tying teacher preparation to student standards. Professional development must be designed around improving knowledge and skills necessary to help all students reach standards" (p. 8). The National Alliance of Business concluded that business leaders, policymakers, governors, school boards, and educators must work together to elevate teaching to a profession and stated that "...we commit to making substantial financial, social, and political investments in teaching for however long it takes to accomplish this goal" (p. 8).

Teacher Licensure and Standards

Teacher certification varies greatly across states, and can be obtained in a number of different ways depending upon the requirements established by each state. Several types of certificates are available, including: initial/probationary, regular/permanent, emergency, private school, and alternative. The certificate requirements for each of the 50 states, the District of Columbia, the Department of Defense Dependents Schools, 10 Canadian provinces, and New Zealand are available from the National Association of State Directors of Teacher Education and Certification (2001). Most states have separate certification for administrators, teachers, and other school professionals such as librarians, reading specialists, and counselors.

Although numerous routes are available to obtaining a teaching certificate, relatively few studies on the effects of these certificates on student achievement have been reported. Hawk, Coble and Swanson (1985) found a strong positive effect of teacher certification on student achievement in mathematics, using a matched comparison group study that included 36 in-field and out-of-field teachers paired with students of the same general ability level. The student data included both pre- and post-tests at the beginning and end of the school year in mathematics. The

study found that courses taught by certified teachers of mathematics had students who performed significantly better in general mathematics and algebra than students who were taught by uncertified teachers of mathematics.

Monk (1994) examined data from the Longitudinal Study of American Youth (LSAY), and found that teachers who had courses in their subject matter area as well as courses in education contributed positively to student achievement. In fact, the contribution of coursework in education often contributed more to student achievement than did teacher coursework in their area of emphasis or expertise.

Druva and Anderson (1983) reviewed the research on more than 65 science education studies. They found consistently positive relationships between students' achievement in science and teachers' backgrounds in both education courses and science courses.

Using the NELS: 88 database, Godhaber and Brewer (2000) followed 8th graders in 1988 through the 12th grade in 1992. They compared how teacher certification and other training-related variables influenced 12th grade student achievement in mathematics and science, controlling for a range of student background factors including 10th grade scores. A total of 3,469 mathematics and science teachers were included in this study. Of the total number of teachers, 2,800 had received certification, although it was not possible to determine if it was in-field or out-of-field, and 24 science teachers and 34 mathematics teachers held temporary or emergency certification. Goldhaber and Brewer also found that students whose teachers possessed a bachelor's or master's degree in math outperformed other students in math and science whose teachers were uncertified or had certification in other areas.

Walsh (2001), in a report prepared for the Abell Foundation, reported little relationship between teachers' educational preparation and student achievement. Walsh went on to report that the research on teacher certification and teacher quality was flawed and outdated. Based on her research, Walsh recommended that course requirements for certification should be eliminated, and school principals should be allowed to hire anyone with a bachelor's degree that had passed a subject-matter examination.

Teach for America has recruited talented liberal arts graduates from competitive colleges, offered the graduates special training, and placed them in difficult U.S. public schools. In an evaluation of Teach for America, Raymond, Fletcher, and Luque (2001) found that in spite of the fact that Houston Teach For America teachers were placed in more difficult classrooms than other teachers, they performed as well as and, in many cases, better than, non-Teach for America teachers. Teach for America teachers were also reported to be less likely to leave the classroom after one year. Raymond, Fletcher, and Luque dispelled the notion that Teach for America was an inferior source of teachers, and showed that different approaches to teacher preparation are feasible.

Studies of the effects of teacher certification in career and technical education on student achievement are even fewer. Erekson and Barr (1985) reviewed the literature on the effects of teacher certification on student achievement in vocational education. They concluded that the literature had so many methodological problems, very few conclusions could be drawn.

Several entities have addressed the issue of teacher education and accountability. Teachers, teacher educators, and those who employ them now have tools available to help ensure that current and future teachers have professional performance guidelines and standards. In 1987, the Educational Testing Service began to develop a framework to help state and local agencies make teacher-licensing decisions called The Praxis Series: Professional Assessments for Beginning Teachers®, which consists of three separate tests. Praxis I is a computer-based assessment of academic skills. Praxis II is a test of teachers' subject matter and principles of learning and teaching. Praxis I is often administered prior to admission to professional standing, and Praxis II is generally administered toward the end of a students' undergraduate program. Praxis III is a classroom performance instrument for assessing actual teaching skills and classroom performance, and is generally administered by the end of the individuals' first year of teaching.

In developing the Praxis III assessment, Danielson (1996) established a framework for teaching that grouped teachers' responsibilities into four domains of teaching responsibility: (a) planning and preparation, (b) classroom environment, (c) instruction, and (d) professional responsibility. These four domains were further divided into 22 components with two to five elements for each component. The framework for teaching provides an overview or map of what is expected of beginning teachers. It can also be used to describe an effective teacher, provide structure for mentors to use in offering advice on how an individual could improve his/her teaching, and communicate what it means to be an excellent teacher.

The National Council for Accreditation of Teacher Education (NCATE) is a 46-state partnership created to help establish high quality teacher preparation (National Council for Accreditation of Teacher Education, 2001). NCATE consists of 33 specialty professional associations of teachers, teacher educators, content specialists, and local and state policymakers representing over 3 million individuals. NCATE reviews of colleges of education integrate both state and national professional teacher preparation standards. The six NCATE standards are grouped under the headings of candidate performance and unit capacity. These standards include:

- Candidate Performance
  - candidate knowledge, skills, and dispositions
  - assessment system and unit evaluation
- Unit Capacity
  - field experiences and clinical practice
  - diversity
  - faculty qualifications, performance, and development
  - unit governance and resources

The Interstate New Teacher Assessment and Support Consortium (INTASC), created in 1987, is a group of state education agencies, higher education institutions, and national education organizations dedicated to the reform of the education, licensing, and on-going professional

development of teachers (Interstate New Teacher Assessment and Support Consortium, 2001). The work of INTASC is guided by one premise: An effective teacher must be able to integrate content knowledge with pedagogical understanding to assure that *all* students learn and perform at high levels. The organization's mission is to promote standards-based reform through the development of model standards and assessments for beginning teachers. The INTASC model core standards for licensing teachers represent 10 principles that should be present in all teaching—regardless of the subject or grade-level taught, and should serve as a framework for the systemic reform of teacher preparation and professional development. These 10 principles include:

- The teacher understands the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches, and can create learning experiences that make these aspects of subject matter meaningful for students.
- The teacher understands how children learn and develop, and can provide learning opportunities that support their intellectual, social, and personal development.
- The teacher understands how students differ in their approaches to learning and creates instructional opportunities that are adapted to diverse learners.
- The teacher understands and uses a variety of instructional strategies to encourage students' development of critical thinking, problem solving, and performance skills.
- The teacher uses an understanding of individual and group motivation and behavior to create a learning environment that encourages positive social interaction, active engagement in learning, and self-motivation.
- The teacher uses knowledge of effective verbal, nonverbal, and media communication techniques to foster active inquiry, collaboration, and supportive interaction in the classroom.
- The teacher plans instruction based upon knowledge of subject matter, students, the community, and curriculum goals.
- The teacher understands and uses formal and informal assessment strategies to evaluate and ensure the continuous intellectual, social, and physical development of the learner.
- The teacher is a reflective practitioner who continually evaluates the effects of his/her choices and actions on others (students, parents, and other professionals in the learning community), and who actively seeks out opportunities to grow professionally.
- The teacher fosters relationships with school colleagues, parents, and agencies in the larger community to support students' learning and well-being.

The National Board for Professional Teaching Standards (NBPTS) is an independent, nonprofit, nonpartisan and non-governmental organization that was created in 1987 to help retain, reward, and advance accomplished teachers through a system of advanced certification. A teacher who has National Board Certification has been judged by his or her peers as one who is accomplished, makes sound professional judgments about students' best interests, and acts

effectively on those judgments (National Board for Professional Teaching Standards, 2001). The NBPTS has identified five core propositions that describe the knowledge, skills, and dispositions that characterize accomplished teaching and has created standards for the nation's K–12 teachers. The five core standards are:

- Teachers are committed to students and their learning.
- Teachers know the subjects they teach and how to teach those subjects to students.
- Teachers are responsible for managing and monitoring student learning.
- Teachers think systematically about their practice, and learn from experience.
- Teachers are members of learning communities.

Standards have been developed for Early Adolescence through Young Adulthood/Career and Technical Education and, as of the year 2000, there were 248 National Board Certified CTE teachers.

Innovative Programs

One of the major suggestions emanating from policy studies for improving education has been to ensure that students are achieving at higher levels of academic and technical competency. Career and technical education has a long history of responding to national needs and initiatives. As the U.S. transitioned from an agriculturally dependent economy to an increasing industrial one, career and technical education has, and will continue to play, an important role in responding to these challenges through its educational programming. This willingness to adapt to new needs is now being applied, as the nation moves to a knowledge-based economy. Among the new developments in career and technical education are career clusters, career pathways, career academies, exemplary programs and promising practices, and accountability and assessment.

Career clusters

The U.S. Department of Education (2000) has established 16 broad clusters that reflect a new direction for education. These clusters include all entry-level through professional-level occupations. The goal for the career clusters was to create curricular frameworks, in broad clusters, designed to organize knowledge and skills in a relevant manner that would help prepare students to transition successfully from high school to postsecondary education and employment in a career area, or both. These career clusters include:

- agriculture and natural resources
- business and administration
- education and training
- health science

- human services
- law and public safety
- government and public administration
- scientific research/engineering
- arts, A/V technology and communication
- architecture and construction
- finance
- hospitality and tourism
- information technology
- manufacturing
- retail/wholesale sales and service
- transportation, distribution, and logistics

The development of two career-cluster areas (health science and manufacturing) has been completed. The development of three additional cluster areas (arts, A/V technology, and communications; information technology; and transportation, distribution, and logistics) began in 1999. Work on the remaining 11 career clusters began in 2001.

Career pathways

Career pathways are a series of academic, technological, and occupational courses and other educational experiences with a career focus in which students participate. Through a continuum of career-focused programs, students are provided with multiple pathways to employment and postsecondary education (Ohio Department of Career, Technical, and Adult Education, 2001). Programs are often based on the 16 career clusters identified by the U.S. Office of Education. Career clusters provide first-hand opportunities for students to explore careers, see relationships, and become knowledgeable about occupational clusters. Career pathways include rigorous academics as well as technical skills, in order for students to be prepared for both postsecondary education and for careers. The rapidly changing environment students will face requires individuals to have broad-based, transferable skills. Students will also need to have well-developed higher order thinking, teamwork, and interpersonal skills.

Career academies

Career academies align clusters of courses around specific career areas, with teachers collaborating on developing integrated academic and vocational programs in a personalized learning environment, delivered over a period of years. These academies are designed to increase

engagement and academic performance, students' personal and academic development, preparation for college and work, postsecondary attainment, and successful employment. More than 4,000 students are enrolled in academies in 17 Philadelphia high schools, with students studying career fields that include the health professions, environmental technology, and automotive repair. Kerka (2000) identified three essential features of career academies: (a) a school within a school—a cluster of students who typically stay with the same group of teachers for 2 to 4 years, forming a close-knit learning community that gives the students personal support, (b) partnerships with employers who sponsor career awareness and work-based learning opportunities, and who also provide resources and financial support, and (c) integrated academic and occupational curriculum centered on a career theme, occupation, or industry to provide focused situated learning.

Exemplary programs and promising practices

Practitioners, researchers, and others often ask for examples of high quality career and technical education programs that can be emulated at other locations and/or studied to determine what makes them successful. Budke and Bragg (2000) conducted an extensive, rigorous search to identify exemplary and promising career and technical education programs. A total of 140 career and technical education programs submitted extensive applications. An external review panel then visited the final candidate programs, prior to each receiving a exemplary or promising designation. The following four criteria were used to select the exemplary programs and promising practices. First, the programs had to be of overall high quality, upholding clear and relevant learning goals that conformed to recognized standards. Second, they had to maintain educational significance on individual and societal levels. Third, the programs had to be able to produce evidence of success. Finally, the programs had to be replicable in other settings. As a result of this process, 4 secondary and 2 postsecondary programs were designated as exemplary, and 20 secondary and 6 postsecondary programs were identified as promising. The four exemplary secondary career and technical education programs included programs in culinary arts and hospitality services, digital design, tech prep electronics technology, and welding technology fabrication. The two exemplary postsecondary career and technical education programs included programs in associate-degree nursing and telecommunications.

Accountability and Assessment

Evaluation has been an area of concern for career ant technical education for many years. Early evaluation efforts centered on conducting follow-up studies to determine the degree to which vocational education graduates found placement in jobs related to their training. The 1963 Vocational Education Act was one of the first pieces of federal legislation directing the states to conduct evaluations of their vocational education programs. Since that time, legislation has continued to recognize the importance of evaluation.

Teacher Supply and Demand

The debate over teacher supply and demand is contentious, to say the least. According to a National Education Association (NEA) Fact Sheet (undated), the nation is in the early stages of the worst ever teacher shortage. The NEA argues that a combination of the following conditions are contributing to the emerging shortage: growing student enrollments, class size reductions, a

graying teacher work force, and the growing salary gap between teachers and other college graduates.

Divergent views have suggested that the alleged teacher shortage is not as acute as claimed by the NEA. Bradley (1999) observed that as daunting as the projected 2 million shortfall in teachers appears to be, it does not mean that the nation is suffering from a teacher shortage. While some Sun Belt and fast-growing states may be scrambling to find teachers, other states are consistently producing more than they can hire (Bradley, March 10, 1999).

Growing enrollments and teacher demand

The U.S. Department of Education (1998) estimates that 2.4 million teachers will be needed in the next 11 years because of increased student enrollments and teacher attrition and retirement. Public school enrollments are projected to exceed 54 million by 2008—an increase of nearly 2 million over the 1998 enrollment level. High-school enrollments will grow by 26%, while elementary enrollments are expected to increase by 17%.

The teacher shortage problem may be further compounded because the anticipated need for teachers is not evenly distributed across the nation, nor across grade levels or program areas. In high-poverty urban and rural districts alone, The U.S. Department of Education (1997) estimated that more than 700,000 teachers will be needed in the next 10 years.

However, raw numbers do not present the total picture regarding the projected need for teachers. According to the U.S. Department of Education (1998) 42% of all public schools in the United States have no minority teachers. Minority students make up 33% of enrollment in U.S. public schools, while the total of minority teachers is just 13.5%. Furthermore, the ranks of minority teachers are expected to reach an all-time low of 5% in the early stages of the 21st century, while 41% of the American students will be minority.

Teacher turnover and compensation

The National Center for Education Statistics (as cited by the National Education Association, undated) stated that the teacher shortage problem will be compounded by the fact that half of the teachers who will be in public school classrooms 10 years from now have not yet been hired. Typically, an estimated 6% of the nation's teaching force leaves the profession yearly, and more than 7% change schools. Additionally, 20% of all new-hires leave teaching within 3 years, and in urban districts, close to 50% of all newcomers leave the profession during their first 5 years of teaching.

Reasons for such high attrition could be due, in part, to general working conditions and unrealistic expectations regarding what the teaching profession entails. However, two significant factors that may contribute to teacher turnover relate to inadequate induction into teaching during the first year of employment and inequity in the compensation of teachers as compared to other college graduates of the same age cohort.

During the past 9 years, less than half of the teachers who were hired within that time frame participated in formal induction programs during their first year of teaching. Furthermore, teachers ages 22-28 earned an average of $7,894 less per year than other college-educated adults

of the same age. The gap was three times greater for teachers 44-50, and was the worst among teachers with master's degrees—who earned $32,511 less than non-teachers (Education Week on the Web Quality Counts, 2000).

A divergent view

As previously noted, there are differing views regarding the issue of a looming teacher shortage. In addition to Bradley (1999), Feistritzer (1998) observed:

> The teacher shortage "crisis" has been resurrected—again. It seems every few years this issue is trotted out and used to get more money, more programs, more publicity, more political points—all in the name of meeting the huge demand, now said to be two million new teachers in the next decade....The first problem with the claim that we'll need millions of new teachers is in what exactly "new" means. When most people hear those words, they think it means teachers who have never taught before. Well, that's not what it means. (The Wall Street Journal, January 28, 1998, p. A18).

Feistritzer analyzed NCES data that revealed that, of the 139,000 "new" public school teachers hired in 1993-94 (the latest year for which data were available), 42% had just finished college, and had never taught before. Twenty-four percent were doing something other than going to college the year before teaching but were teaching for the first time. The remaining 34% of "new" teachers were actually former teachers coming back into the profession. In 1987-88, 52% of the "new" teachers were re-entering the profession. Based on 1993 U.S. Census Bureau data, there were more than 6 million people holding at least a bachelor's degree in education. Feistritzer concluded that there are plenty of people in the country who are fully qualified to teach who are not teaching.

Cornett, as cited in Bradley (1999), pointed out that the nation cannot be painted with a broad brush. For example, Connecticut, Minnesota, New York, Pennsylvania, and Wisconsin consistently produce more teachers than their schools hire—although some urban districts in those states persistently experience shortages in qualified teachers. In 1996-97, New York licensed 21,500 teachers, but only 5,900 were hired. Still, during that same year, New York schools hired 9,000 unlicensed teachers, mostly in New York City.

In Oklahoma, the Southern Regional Education Board (1998) completed a detailed study of teacher supply and demand, and found that the problem was not the lack of mathematics teachers. It was that people who were certified to teach math were not working in schools. Only 54% of college graduates trained between 1994 and 1996 to teach math were actually teaching that subject by 1996. The likely reason was that starting math teachers earned $24,000, while math majors could earn $40,000 to $50,000 in the computer field when fresh out of college. Darling-Hammond (as cited in Bradley, 1999) pointed out that states need to be more strategic in pinpointing where teachers are needed and in what fields before determining a course of action.

Reliable teacher supply and demand data directly related to career and technical education have not been readily available; however, it was noted that in some regions of the country, there were reported shortages of family and consumer sciences teachers and technology education teachers. But even in the absence of hard teacher supply/demand data, based on selected

circumstances confronting public education in general, there are some issues that have direct implications for career and technical education:

1. Are there geographic regions and/or career/technical fields that will be facing teacher shortages, and if so, where are they?

2. How can teacher supply/demand imbalances across various regions and program areas in career and technical education best be addressed?

3. How will an increasingly diverse student clientele and declining minority teacher population impact career/technical education, and what appropriate actions will need to be taken?

4. What recruitment and retention measures should be considered to attract and retain quality career/technical education teachers?

A FUTURISTIC SCENARIO

Career and technical teacher education programs occur in a variety of administrative units, and with many organizational arrangements (Lynch, 1991; Bruening, Scanlon, Hodes, Dhital, Shao, & Liu, 2001). In preparing a futuristic scenario, it is necessary to first have a framework in which to present the scenario.

A Framework

The Council for Basic Education (CBE) and the American Association of Colleges for Teacher Education (AACTE) have been involved in a five-year, multi-state Standards-based Teacher Education Project (STEP™) to help universities redesign their teacher preparation programs to meet the content knowledge and pedagogical skills to support K–12 standards (Council for Basic Education, 2001). The STEP framework asks teacher education institutions to answer 17 questions as they analyze their programs and redefine their teacher education programs:

1. What requirements exist for entering freshmen to the institution?
2. What are the prerequisites for entry into the teacher preparation program?
3. What are the characteristics of the teacher preparation program?
    - number of candidates
    - graduation rates
    - hiring rates
    - licensure rates
    - tenure in teaching careers
4. What are program requirements for teacher candidates?
5. What kinds of content pedagogy opportunities are offered teacher candidates? How are discipline-based faculty involved?
6. What discipline-based courses are offered teacher candidates, and how appropriate are they in light of K–12 standards?
7. In what ways have K–12 standards already been incorporated into the teacher preparation program?
8. What programmatic relationships exist between arts and sciences and education in teacher preparation?
9. From the graduates' perspective, what are strengths and weaknesses of their classroom preparation?

10. How are teacher candidates assessed in terms of content knowledge, content pedagogy, instructional knowledge and skills, and assessment knowledge and skills?

11. What resources are in place to ensure appropriate education and support for teacher candidates who do not initially meet standards?

12. What alternate programs are offered for teacher candidates?

13. What are the programmatic characteristics of the teacher preparation program?

    - strong disciplinary preparation
    - standards linked with curriculum
    - courses in disciplines linked with methods
    - courses in disciplines linked with courses in assessment
    - preparation for incorporating technology as a tool in instruction and assessment

14. Does the teacher preparation program work with districts to track entry, retention, and success of graduates? Are these data used to improve programs?

15. What support is in place for new teachers in their first and second years of teaching?

16. How do the data on K–12 student achievement in core subject areas reflect on teacher preparation?

17. How are faculty rewarded for standards-based teacher preparation work?

Lynch (1996) identified 10 principles that serve as the foundation upon which high quality vocational and technical teacher education may be based. These 10 principles are:

1. Faculty are committed to their students and to students' professional development as lifelong learners.

2. Faculty use curriculum and instructional techniques to integrate theory with practice, academic and workforce education, professional education and subject matter, and learning theory and workforce preparation.

3. Faculty understand the philosophy, contemporary concepts, research, effective practice, and methods of inquiry related to workforce preparation and development.

4. Faculty use dynamic pedagogy, based on learning theory and practices appropriate for youth and adults.

5. Faculty are partners in learning communities through which they model collaboration and democratic processes for their students.

6. Programs are dynamic and change-oriented.

7. Programs are grounded in academic education, workplace subject matter, workplace processes, technology, professional education and pedagogy, and clinical experiences.

8. Programs reflect cultural diversity.

9. Colleges and universities (and their inherent administrative structures) that offer programs to prepare vocational and technical teachers are committed to such preparation and provide adequate resources to sustain them at high quality levels.

10. Colleges and universities provide a clearly identified group of academic and clinical faculty for whom vocational and technical educator preparation is a top priority.

Sears and Hersh (1998) reported a framework that included the components for designing teacher education programs that was developed based on the work of Howey and Zimpher (1989) and, to a lesser extent, Katz and Rahts (1982). The framework suggested that the following components be considered when designing effective teacher education programs:

- **Goals**—the mission, values, and objectives of the teacher education program;
- **Curriculum**—the skills, competencies, philosophical principles, and academic disciplines transmitted to students via the activities and events constituting the teacher education program;
- **Instructional Strategies**—the instructional techniques and approaches modeled by the faculty and taught to preservice teachers;
- **Contexts**—the various contexts (classrooms, laboratories, community, workplaces) in which student learning occurs;
- **Learners**—pre-service student characteristics such as age, sex, socioeconomic status, intellectual ability, ethnicity, and any other characteristic that can be thought to be related to the nature and outcome of teacher education programs;
- **Staff**—characteristics (age; education; ethnicity of the faculty, classroom teachers, and other staff connected with the teacher education program);
- **Themes**—threads that tie key concepts together throughout a variety of courses, practica, and school experiences. Themes can take on the nature of a primary concept of learning how to teach, or can be articulated in terms of a basic respect for something such as individual diversity;
- **Ethos**—the intellectual and social climate or atmosphere of the program;
- **Partnerships**—planned relationships with other agencies or institutions to further shared goals and values;

- **Regulations**—the laws, regulations, legal restrictions, and stipulations related to teacher education and certification, as well as the requirements of school districts, local education authorities, national certifying bodies, etc;

- **Location**—the location of a teacher education program on a conventional campus, urban commuter campus, a teachers' center, campus laboratory school, etc., and the type of location (urban, rural, suburban) (p. 9-10).

The framework has recently been revised to include five components of teacher education: mission/scope; curriculum and instruction; roles, responsibilities, and relationships; governance; and evaluation.

A Scenario

This scenario was developed based on the Sears and Hersh (1998) framework for contextual teaching and learning and the factors influencing career and technical education that were presented earlier in this paper. The Sears and Hersh framework allows a career and technical teacher education program to incorporate the 17 questions to be asked in analyzing teacher education programs developed by the Council for Basic Education (2001) and the principles of high quality vocational and technical teacher education identified by Lynch (1996). The framework (see Figure 1) builds on the major points discussed earlier in this paper, and provides a "clean slate" for thinking about the future.

For the purpose of this paper, a hypothetical university—Utopia University—will be used to present a scenario for career and technical teacher education. Utopia University is a state university, established in 1890, with an enrollment of approximately 23,000 students. The mission statement of Utopia is to offer a range of student-centered educational programs in the liberal arts, the sciences, and the professions; advance and disseminate knowledge; and provide public service. The Utopia University president promotes active outreach and engagement activities to extend the university to the entire state. The university is composed of seven colleges: Agriculture and Life Sciences, Arts and Science, Business, Design, Education, Engineering, and Human Ecology. Each of the college deans reports to the provost. Utopia University is the second-largest university and the largest career and technical teacher education program in that state. Students wishing to be admitted to Utopia University must have completed 16 units of required academic courses—four units (years) of English, four units of mathematics, three units of social sciences, three units of natural science, and two units of a foreign language. Additionally, prospective first-year freshmen seeking admission to the University shall be ranked in the 50th percentile or higher of their graduating class in an accredited high school.

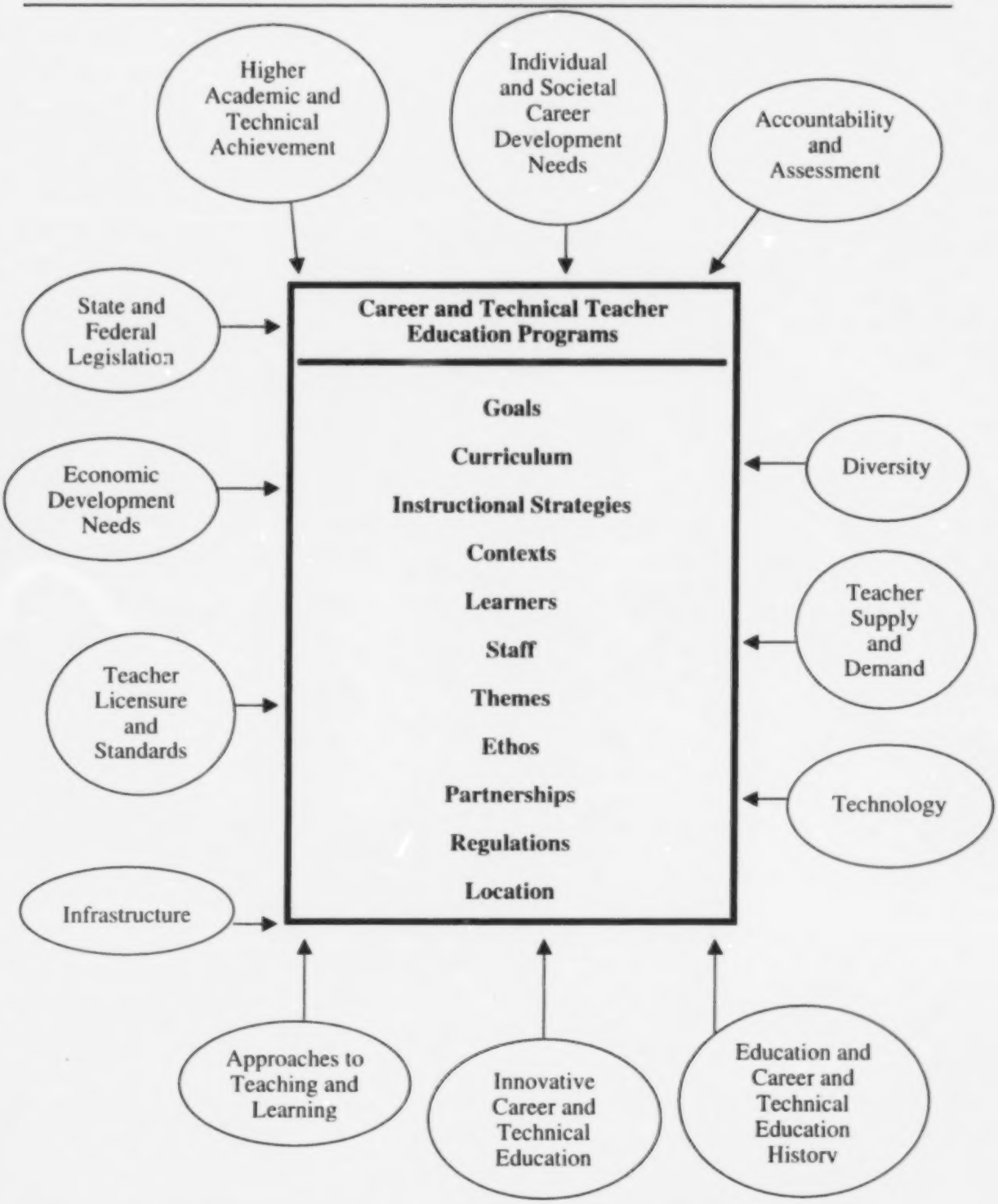

Figure 1. Conceptual framework for career and technical teacher education

Students may enter the career and technical teacher education route through one of three routes. First, regular undergraduate students are admitted to the career and technical teacher education program based on passing the Praxis I examination and earning an overall GPA of 3.0. The career and technical teacher education interdisciplinary program is housed in four separate colleges: Agriculture and Life Sciences, Business, Education, and Human Ecology. An interdepartmental council governs the career and technical teacher education program, and the responsibility for the program rotates among the colleges every three years. The agriculture, business, education, and human ecology programs each graduate approximately 25 students a year who have completed an undergraduate program in teacher education. These students have completed a total of at least 135 semester credit hours in order to graduate with a bachelor of arts or a bachelor of science degree. These 135 credit hours are distributed among courses in general education (30 credit hours) across the university, courses in the college (60 credit hours) in which their teacher education program is offered, and courses in teacher education (45 credit hours) across the four areas offering teacher education. These students must pass the Praxis II: Subject Assessments and Principles of Learning and Teaching Tests during their last year of college. In order to obtain their teaching licenses, they must be enrolled in a mentoring program for first-year teachers and pass the Praxis III: Classroom Performance Assessments by the end of the first year of teaching.

Second, students who have a bachelor's degree in one of the four colleges may also qualify for admission to the teacher education program of that college by passing the Praxis I academic skills and Praxis II subject matter and principles of learning and teaching examinations. These students will then be enrolled in the master of education degree program (30 semester graduate credits), which includes courses in planning and preparation, the classroom environment, instruction, and professional responsibilities. Individuals enrolled in the master of education degree program must pass the Praxis II: Subjects Assessments and Principles of Learning and Teaching tests prior to their participation in a year of supervised internship at a local education agency that is willing to employ them on a one-year probationary basis. In order to receive a teaching license, they must successfully pass the Praxis III: Classroom Performance Assessments examination by the end of their probationary one-year program.

Third, an alternative licensure program (two-years in length, and including 25 semester credits in planning and preparation, the classroom environment, instruction, and professional responsibilities) is available for individuals who are occupationally qualified, but do not have a bachelor's degree. In order to enter this program, the prospective students must pass the Praxis I exam, Praxis II subject matter and principles assessment, and have been tentatively approved for employment by a local education agency. This program is taken concurrent with their first two years of employment, and includes 25 semester credit hours in planning and preparation, the classroom environment, instruction, and professional responsibility. They must pass the Praxis II examination at the end of the two-year, 25-semester-hour program to continue in the alternative certification program. The individual must also be enrolled in the school's beginning teacher assistance program—including a mentorship and supervised internship. After completing the two-year program and passing the Praxis III Classroom Performance Assessments, and no later than the end of their third year of teaching, the students will be licensed.

The faculty with full-time responsibilities for career and technical teacher education, by college, are as follows: agriculture (five), business (four), education (six), and human ecology

(three). Approximately 97% of the students accepted in the program graduate. Utopia University has, historically, been looked upon as the major source of teachers for career and technical education in the state.

Goals

Two years ago, the four career and technical teacher education programs held a planning conference to bring the faculty, staff, and students together and develop a mission, goals, and objectives. The mission that emerged for the career and technical teacher education program was: "We are a premier source of professionals and knowledge essential for meeting the workforce needs of youth and adults as they function in their workplace, community, and family." The principles that guide their work include:

- We are student-centered in our approach to teaching and learning.
- We use teaching principles that develop our students' academic and technical skills in a variety of contexts in order to solve individual and group problems related to their families, communities, and work.
- We believe in the worth of all individuals and careers.
- We continually strive to improve the quality of everything we do.
- We outperform others in meeting the needs of the workplace, community, and family.
- We are reliable and timely.
- We are relevant to people's lives and their communities.
- We have a sense of urgency in all we do.
- We support the personal and professional growth of our faculty.
- We act with integrity, honesty, and a sense of ethics.
- We keep our commitments.
- We are accountable for our activities.

Curriculum

The career and technical teacher education courses are developed based on the Danielson (1996) framework for teaching that includes four domains of teaching responsibility: (a) planning and preparation, (b) classroom environment, (c) instruction, and (d) professional responsibility. Using the Danielson framework should enable the students to be proficient in the knowledge and skills to enter beginning teacher assistance programs and to pass the Praxis III examination at the end of their first year of teaching. The faculty is well-grounded in the philosophy of career and technical education, and has provided excellent examples of courses

that integrate theory and practice. The syllabi for the courses in career and technical education specify the problem-based learning, self-regulated learning, and higher order thinking strategies that will be included. Additionally, the syllabi identify and describe the contexts in which the course will be offered.

Career and technical teacher education students participate in a three-week internship between their freshman and sophomore year in college. This internship is usually in a public school or institution, and is designed to give real teaching experiences prior to being admitted to the career and technical teacher education program. Students are required to have had actual work experience in a business or industry related to the area they will be teaching. The required work experience is documented through paid work experience (full- or part-time) or college internships prior to entering the teacher education program.

Instructional strategies

The faculty emulates contextual and constructivist approaches to teaching and learning. These approaches include problem-based learning that encourage higher order thinking skills; meaningful engagement through reflection and self-evaluation; addressing students' cultural and social context; multiple authentic assessments to address students' knowledge and skills; cooperative learning in group settings; and small group interactions.

Contexts

The faculty assumes that learning occurs in multiple contexts. These contexts include families, business and industry, and classrooms and laboratories.

Learners

Learner characteristics such as age, gender, socioeconomic status, intellectual ability, and ethnicity are important items that the faculty takes into consideration in developing their courses and the career and technical teacher education program. Issues such as equity and diversity are incorporated in the career and technical teacher education program. The career and technical teacher education program also takes into consideration ethnic, cultural, and socioeconomic factors in determining the location of the field experiences. The faculty attempt to place students in field experience contexts that are different from those that the students have previously experienced.

Staff

The faculty considers all those involved in the teaching and learning process to be staff. Staff include individuals such as the faculty themselves, administrative and office associates, graduate students, mentors, and field experience instructors and administrators.

Themes

Several themes are used to ensure that the career and technical teacher education program is coherent across all of its courses. These themes include: cultural competence, gender equity, academic and technical skill integration, content relevance, accountability and assessment, educational technology and distance education, and life-long professional development.

Ethos

Faculty in the career and technical teacher education program make it clear that the strength of their program is based upon student-centered learning, mutual respect for one another, and the worthiness of all occupations. Additionally, the faculty demonstrates a respect for equity and diversity in their program.

Partnerships

The faculty and staff at Utopia University are dedicated to having a seamless program and process that ensures the teaching and learning process results in high quality teacher education graduates. In order to develop a seamless system, it is essential that Utopia University form partnerships with cooperating agencies. The career and technical teacher education program at Utopia University has critical alliances with the state department of education, local education agencies providing field-based experiences, and the professional career and technical education teacher associations.

Regulations

The career and technical teacher education program at Utopia University relies upon the The Praxis Series: Professional Assessments for Beginning Teachers, and consists of three separate tests. The Praxis I assessment of academic skills must be passed prior to admission to the career and technical teacher education program, no later than the end of their sophomore year. Students must pass their Praxis II test of their subject matter and principles of learning and teaching no later than the end of their last year of college. The Praxis III performance assessment of actual teaching skills and classroom performance is administered by the end of the first year of teaching, except for those teachers who are in the alternative licensure program, where it is administered at the end of the third year of teaching.

Location

The career and technical teacher education program's main location is on the Utopia University central campus. However, the program also considers extended locations at the education agencies participating in students' field experience, educational agencies hiring the graduates of the program, and the state education agency.

POLICY IMPLICATIONS

It is essential that states have a high quality work force, if they are to be economically competitive. When individuals increase their academic and technical skills, they can move into the workplace and be more productive as well as increase their earnings. Policymakers, recognizing these facts, have identified education as an important issue, and have been keenly interested in increasing the academic and technical skills of American students in order that these individuals can more effectively participate in an international economy as world-class workers and citizens. The major policy initiatives have included setting high standards, increasing the courses required for graduation, and establishing high stakes testing. Although the preparation of high quality teachers is critical in helping students achieve at higher levels, relatively little has been done to improve the quality of teacher education. Even less attention has been given to career and technical education teacher educators, who have an equally challenging responsibility in teaching both technical and academic skills to their students.

Producing high quality career and technical teachers that are knowledgeable of their content and pedagogy is a way that states can equip students with high levels of technical and academic skills. This, in turn, can help states and the nation have a higher quality work force and become more economically competitive.

This section identifies policy actions that should be considered at the federal, state, and local levels, and by business and industry, to improve the quality of career and technical teacher education.

Federal Level

1. Congress should amend the Carl D. Perkins Vocational-Technical Education Act Amendments of 1998 to include providing undergraduate scholarships for high quality students enrolled in career and technical teacher education programs.

2. Congress should amend the Carl D. Perkins Vocational-Technical Education Act Amendments of 1998 to include providing funds to support career and technical teacher education infrastructure (classrooms, buildings, and equipment—including technology) and internships in business and industry for career and technical teacher educators.

3. Congress should amend the Carl D. Perkins Vocational-Technical Education Act Amendments of 1998 to provide leadership development awards (including subsistence for individuals and their dependents, and tuition and fees for institutions of higher education) for individuals to attend graduate education programs in order to meet the needs for qualified career and technical education personnel, including teacher educators, researchers, administrators, supervisors, and instructors.

4. The U.S. Department of Education, Office of Vocational and Adult Education, in cooperation with related organizations and practitioners, should provide leadership in developing rules and regulations to enhance and improve career and technical teacher education.

5. The U.S. Department of Education, Office of Vocational and Adult Education, should sponsor conferences and forums that address the concerns and issues of career and technical teacher education.

National Level

1. Career and technical teacher educators should encourage national education associations (e.g., Association for Career and Technical Education, American Association of Community Colleges, Council of Chief State School Officers, National Association of State Universities and Land-Grant Colleges) to support workforce development through activities such as conference programs, special studies, and professional writings.

2. The Association for Career and Technical Education and the American Association of Community Colleges should promote career and technical education and the professional development of its teachers involved in workforce development, and encourage legislative and policy efforts with national business organizations (e.g., National Alliance of Business, National Association of Manufacturers, Business Roundtable, U.S. Chamber of Commerce, and other national trade organizations).

3. The Association for Career and Technical Education and the American Association of Community Colleges should promote workforce development through career and technical education with national associations (e.g., National Governors Association, National Conference of State Legislatures) and encourage them to develop policy recommendations for Congress and the President.

State Level

1. State legislatures should enact legislation to support workforce development programs through career and technical education, and support affiliated high quality teacher education programs offered by colleges and universities.

2. State legislatures should provide financial incentive programs such as scholarships, student loan forgiveness, signing bonuses, and housing programs to increase the supply of high quality career and technical teachers.

3. State legislatures should provide financial support for those career and technical education teachers who seek and achieve National Board for Professional Teaching Standards certification.

4. State legislatures should establish a coordinating board for career and technical teacher education that would align teacher education programs with state and local standards; advise on the development of licensure and certification compatible with career paths for teachers; recommend exchange programs with business and industry; coordinate resources; and evaluate accomplishments of teacher education.

5. State education personnel should monitor federal legislative and policy practices that negatively impact career and technical teacher education, and take appropriate actions as warranted.

6. State legislatures should provide incentive funds for hiring career and technical education teachers who are willing to accept challenging teaching assignments (e.g., districts or schools that have a high proportion of families with low socioeconomic status, districts or schools in isolated rural areas and low-income inner-city areas, and students with special needs).

7. State legislatures should provide venture capital for career and technical education teachers to try innovative ways of improving students' academic and technical knowledge and skills.

8. State education agencies and the board for higher education should coordinate their efforts related to career and technical teacher education.

9. State education agencies and career and technical teacher educators should establish customized standards for quality career and technical teacher education programs that include multiple career paths in order to attract, motivate, and retain high quality teachers—resulting in an increased supply.

10. State education agencies should monitor institutional efforts in career and technical teacher education to ensure standards are met.

11. State education agencies should sponsor and convene programs, conferences, and forums on the status and best practices related to career and technical teacher education.

12. State education agencies should identify and nurture career and technical educators that have the potential to become effective advocates and leaders for related career and technical teacher education and state and federal legislation/policies.

13. State teacher licensing agencies should allow career and technical education teachers' licenses and credentials to be transferable across state lines.

14. State teacher licensing agencies should provide for alternative licensing and certification for programs for nontraditional teacher candidates.

15. Presidents, deans, and career and technical teacher education faculty should develop a policy for college and university career and technical teacher education's role in workforce development, and design programs to meet that role.

16. College presidents and deans should place more emphasis on developing high quality career and technical teachers in order to expand the student base for recruiting outstanding students known to be interested in occupations related to their colleges (e.g., agriculture and life sciences, business, health, human ecology, and technology).

17. College and university career and technical teacher education faculty should establish technical and pedagogical standards for what it takes to be a career and technical education teacher.

18. College and university career and technical teacher education faculty should recruit prospective career and technical education teachers from diverse population bases.

19. Career and technical teacher education programs should be student-centered and emphasize both theory and practice.

20. Career and technical teacher education programs should include knowledge and skills on current topics such as the integration of academic and technical skills, career clusters, career academies, accountability and assessment, and career development.

21. Career and technical teacher education faculty should conduct research on topics such as career and technical education supply and demand of teachers, the amount and kind of academic and technical skills that career and technical education students need, the degree to which teachers prepared by different means (e.g., baccalaureate, post-baccalaureate, and alternative certification) contribute to students' achievement of academic and technical skills, the effectiveness of teacher education programs delivered through distance education, and factors contributing to recruiting teachers from diverse populations.

22. College and university career and technical teacher education faculty should develop multiple entry points into the program (e.g., baccalaureate, post-baccalaureate, and alternative licensure) for nontraditional students.

23. College and university career and technical teacher education programs should include information on the use of technology in their programs.

24. College and university promotion and tenure guidelines should be revised to give more recognition for outreach and engagement activities such as teacher education programs.

25. College and university career and technical teacher education faculty should form partnerships with state education agency personnel, community colleges, local education agencies, and professional teacher associations in developing induction and mentoring programs for beginning teachers.

26. College and university career and technical teacher education faculty should form partnerships with state education agency personnel, local education agencies, and professional teachers associations in designing professional development programs with outcomes tied to standards and assessment that are data-driven.

27. College and university teacher education faculty should be encouraged to spend time in the classrooms of local education agencies.

28. College and university teacher education programs should place higher emphasis on helping prospective teachers understand and be able to meet the education and social needs of a diverse student base.

Local Level

1. Local education agencies should provide compensation for career and technical teachers that is market-driven, and provide higher pay for teachers who do more work and are judged to be among the best.

2. Local education agencies should develop induction and mentoring programs for their beginning teachers.

3. Teachers should have quality time and financial assistance available for professional development programs.

4. Teacher evaluation should include input by principals and peers, and be performance-based, including teachers' knowledge of course content, program planning and preparation, the classroom environment, instruction, and professional responsibilities.

5. Local education agencies should provide venture capital for career and technical education teachers to try innovative ways of improving students' academic and technical knowledge and skills.

Business and Industry

1. Career and technical teacher educators should form partnerships with business and industry leaders, and ask them to serve on advisory councils to advise on the technical and academic knowledge and skills employees need.

2. Career and technical teacher educators and teachers should ask business and industry to provide internship and educational opportunities for updating their knowledge of the workplace.

3. Career and technical teacher educators should ask business and industry to serve as speakers in their classes

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